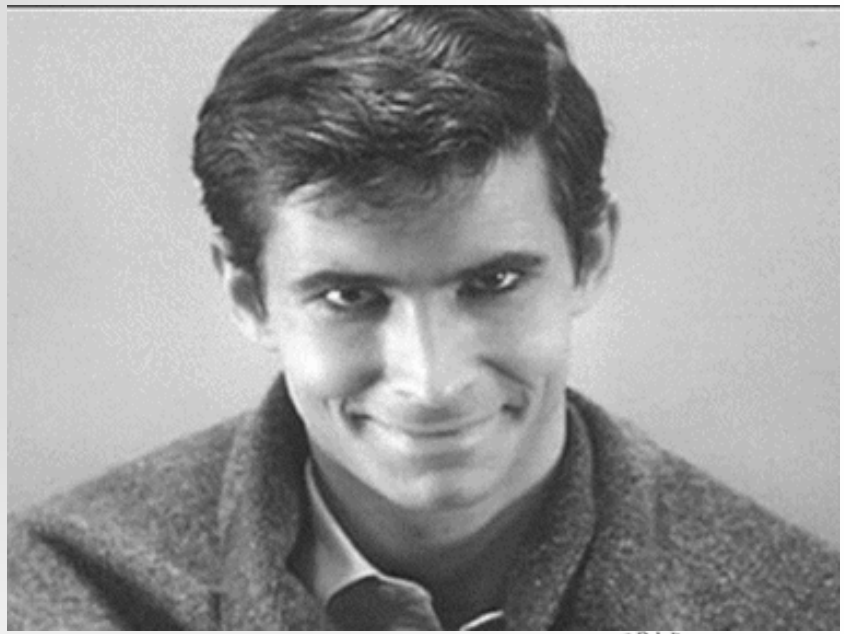
Naturally Occurring Radioactive Material

Bureau of Air and Radiation

The Faces of NORM

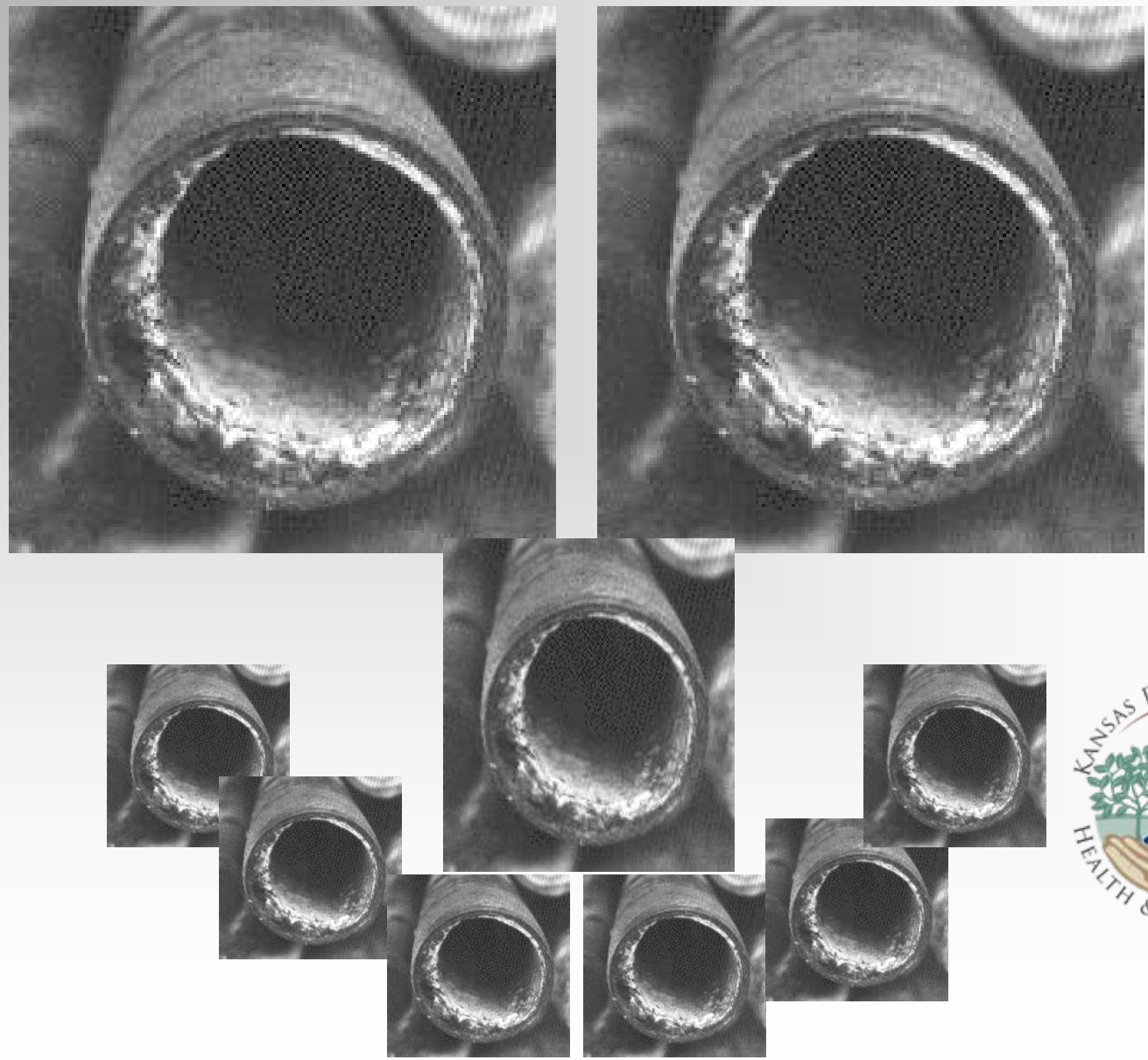


KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT
KDHE

Faces of NORM

Norm Cash

Detroit Tigers



Introduction

- **Naturally Occurring Radioactive Material**
  - **NORM**
- **Technologically Enhanced**
  - **TENORM**
- **Naturally Occurring and Accelerator Produced Radioactive Material**
  - **NARM**

Regulatory Impact

- **Proposed NRC Rulemaking**
  - **http://nrc-stp.ornl.gov/asletters/other/sp06068.pdf**
  - **New definition of byproduct material**
    - **Accelerator produced material**
    - **Discrete sources of Ra-226**
    - **Discrete sources of NORM meeting specific criteria**

Impact on State Regulations

- **Kansas is an Agreement State**
  - **NORM is not specifically addressed**
  - **Each case would qualify based on regulatory limits of radionuclides present**
- **Review under way to ensure compatibility with proposed Federal Regulations**

NORM in Kansas

- **Oil and gas**
  - **Rejected shipments at recycling facilities**

NORM in Kansas

- **Oil and gas**
  - **Used pipe**

NORM in Kansas

- **How pipe becomes radiation concern**
  - **Salt water forms scale in piping**
  - **Barite, barium sulfate present in oil deposits**
  - **Barite incorporates radium**
  - **Used piping sold for inexpensive fencing**
  - **Old fence taken to scrap yard**
  - **Radiation alarms sound at scrap yard**
  - **Pipe is rejected**

NORM in Kansas

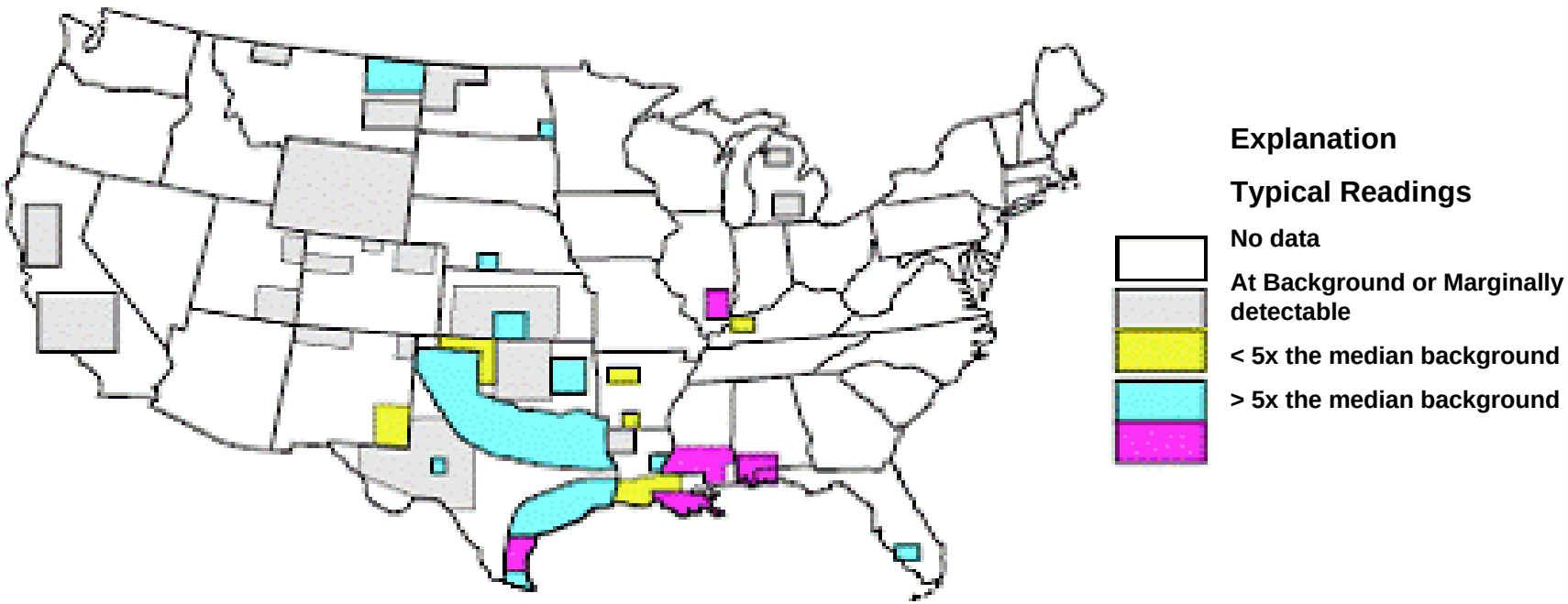
- **Scrap yard contacts KDHE Radiation Control Program**
- **KDHE transmits USDOT transportation exemption to scrap yard via facsimile**
  - **Exemption allows direct transport back to origin of shipment**
  - **KDHE follows up with origin site regarding disposition of material**
  - **Normally segregated and stored on-site**

Accumulation of NORM

- **Pipe cleaning operations**
- **Levels of concern can be achieved**

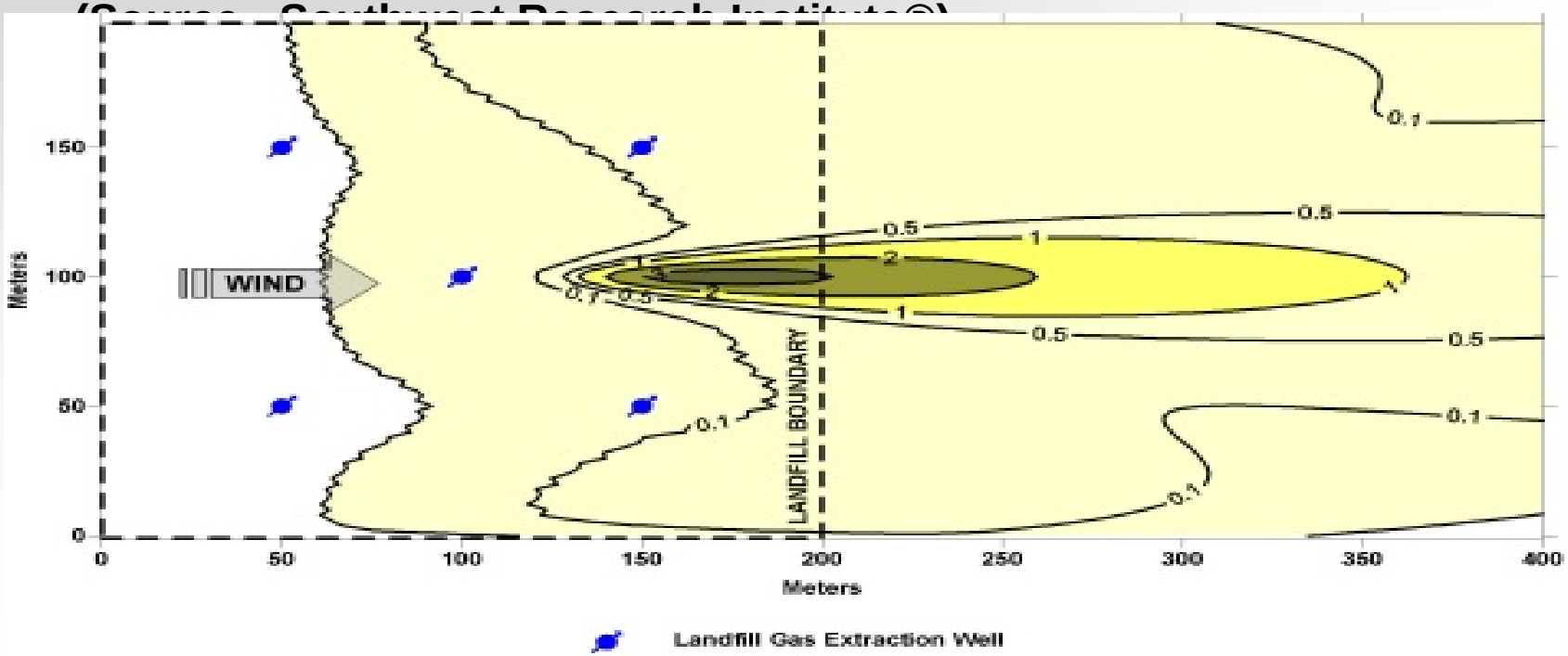
NORM in Kansas

- **Oil and gas**
  - **Radioactive oil field equipment**
    - **(USGS Fact Sheet FS-142-99 September 1999)**



Landfill Data

- **Atmospheric radon plume from landfill gas venting from buried radium-bearing waste**



Radium

- **Uptake in plants**

Autoradiograph of plant material containing radioactive isotopes

(Source: Southwest Research Institute®)

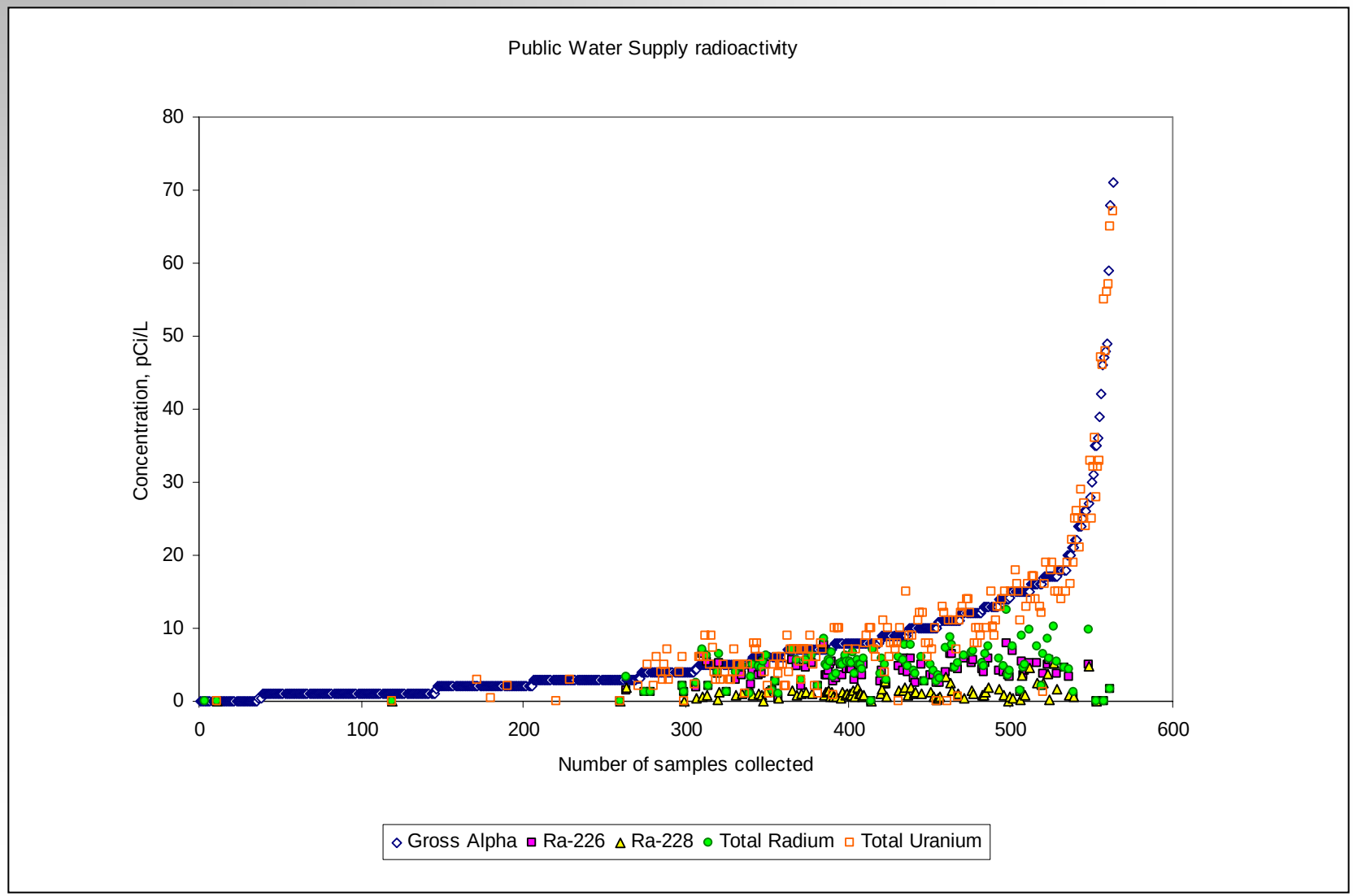
NORM in Kansas

- **Mining**

NORM in Kansas

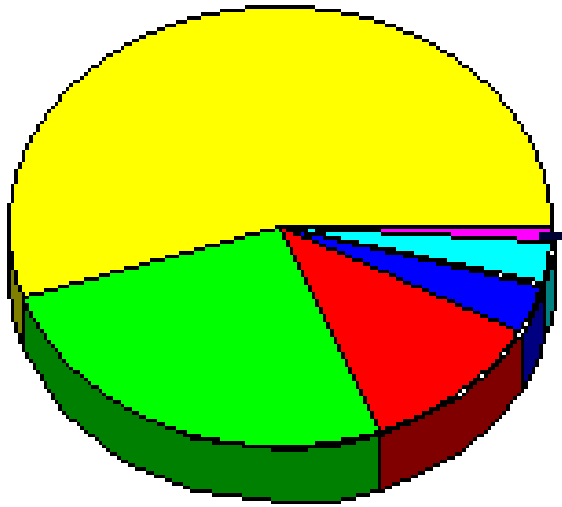
- **Water Treatment**

Public Water Supplies



Sources of Radiation Exposure

From: NCRP Report No. 93



Other

- Occupation 0.3%
- Fallout < 0.3%
- Nuclear Fuel Cycle 0.1%
- Misc. 0.1%

- Radon (55%)
- Natural Sources (excluding Radon) (26%)
- Medical X-rays (11%)
- Nuclear Medicine (4%)
- Consumer Products (3%)
- Other (<1%)

Background Levels

What is typical?

8.2 µR/h

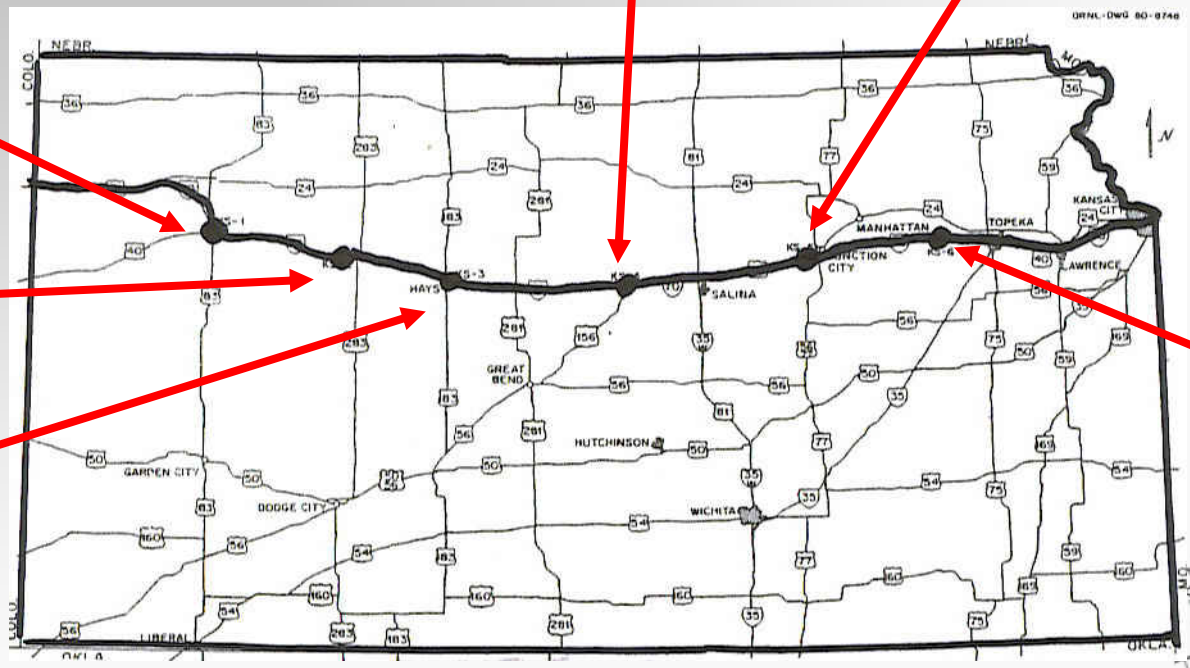
6.6 µR/h

14 µR/h

12 µR/h

10 µR/h

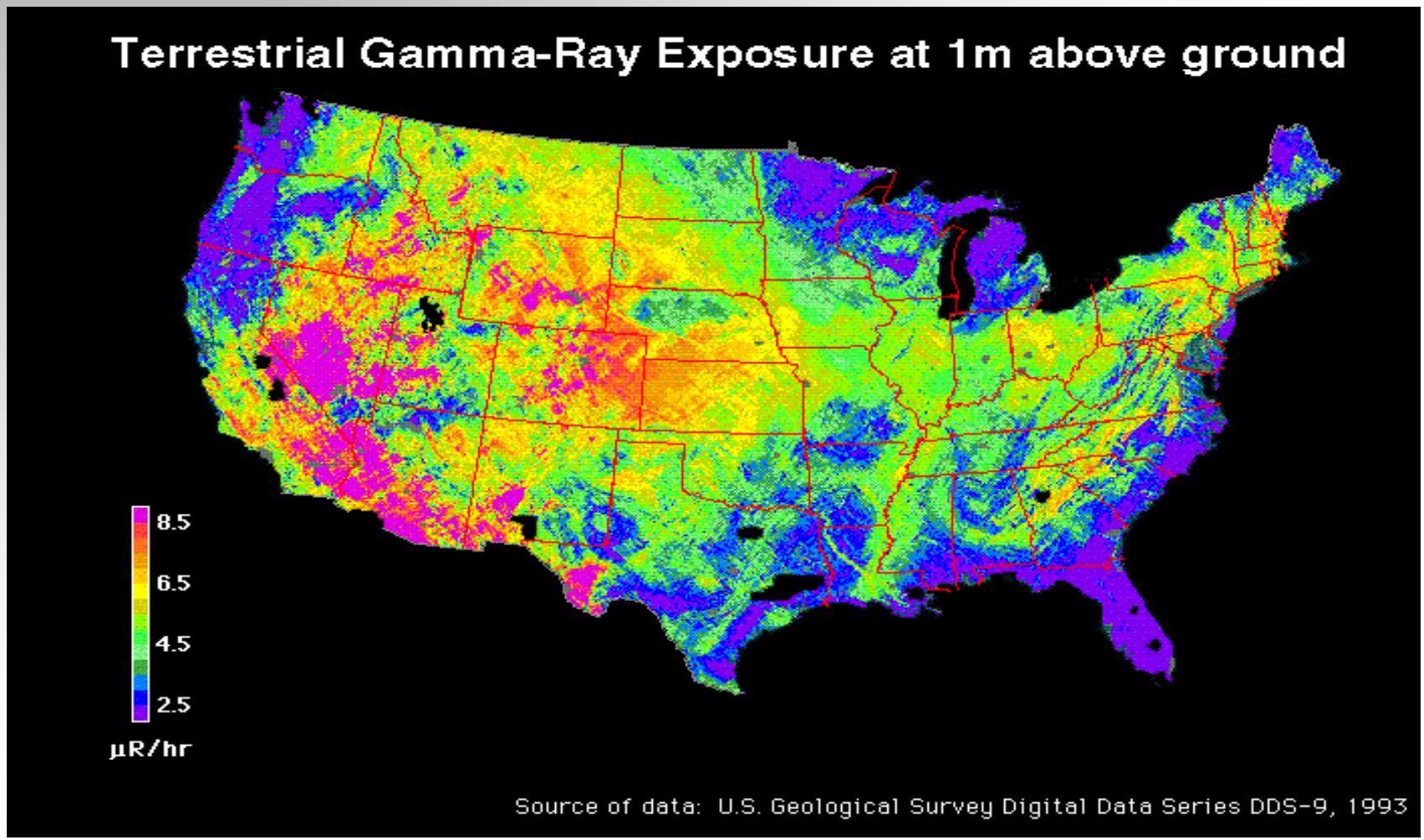
9.8 µR/h



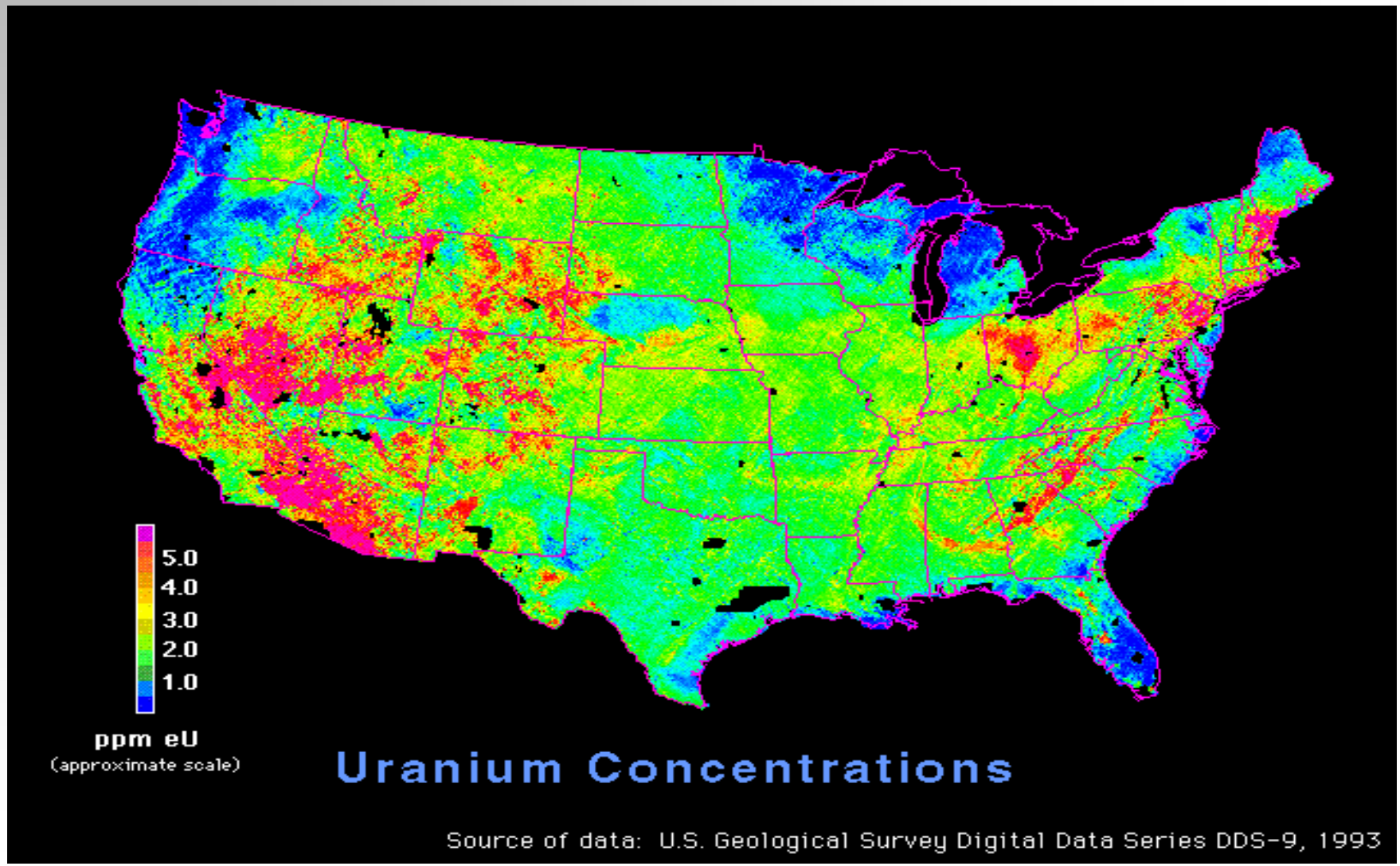
Kansas background radiation levels, 1975

Source: T.E. Myrick, B.A. Breven, F.F. Haywood ORNL/TM-7343, November 1981

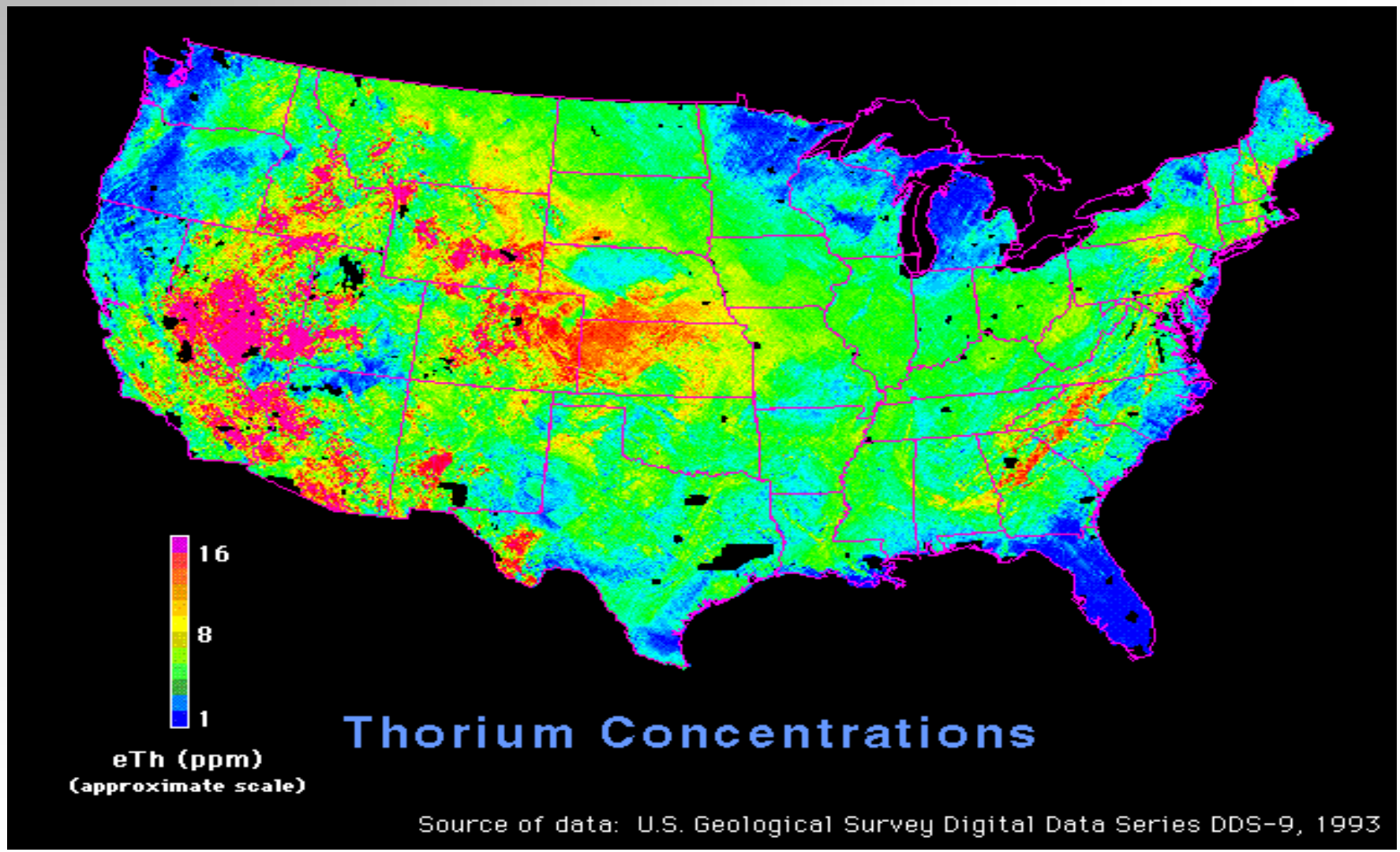
Background Radiation



Uranium Concentrations



Thorium Concentrations



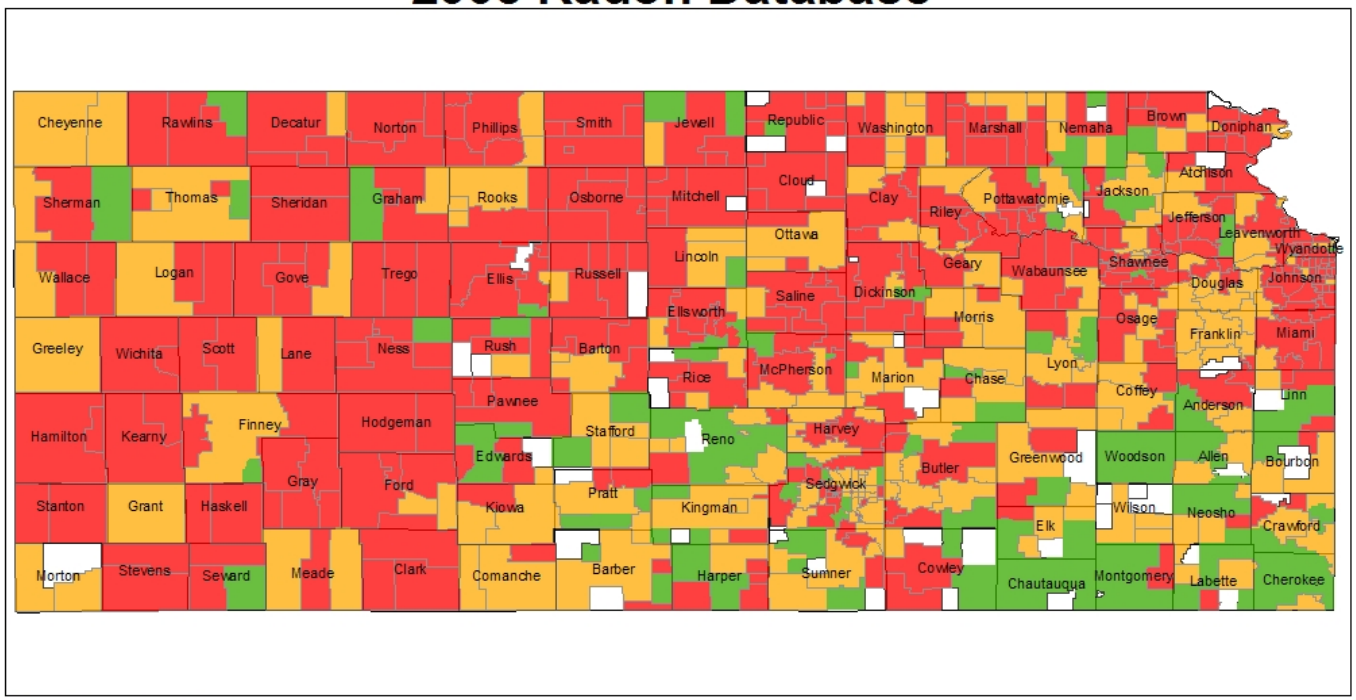
NORM Levels

- **Levels of Concern**
  - **Gamma exposure rate:**
    - **25 uR/h greater than background**
  - **Concentration Limit in Soil**
    - **5 pCi/g to 30 pCi/g depending on radon emanation rate, rate of less than**

      20 pCi/m^{2}s can use the upper soil limit
  - **Loose Surface Contamination**
    - **100 cpm greater than background**

Radon Gas is Everywhere

Composite Radon Levels by Kansas County
2005 Radon Database



Total Number of Measurements = 31,084
Average Radon Level = 4.6
Maximum Radon Level = 204.4
Total Readings 4 pCi/L or above = 12,204

Average Radon by Zip Code
kszip
2005_June_Update.AVGRAD
- No Data
- 0.1-1.9 pCi/L
- 2.0 - 3.9 pCi/L
- 4.0 or greater pCi/L

39% of homes tested in Kansas exceed EPA recommended action level of 4.0 pCi/L

KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT
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Kansas Radon Program
http://radon.oznet.ksu.edu

- Test your home for radon
- Contact Kansas Radon Program for more information

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Questions